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Driver authorization system

The invention relates to a driver authorization system and a pushbutton for means of transport for activating ignition lock functions of a means of transport.

Keyless driver authorization systems, so-called keyless go systems, are in standard use today in means of transport. A keyless go system enables a user of a vehicle to open and to start the vehicle without being in possession of a vehicle ignition key. However, the driver must carry a mobile release device, for example, in the form of a credit card, as part of the keyless go system. The keyless go system controls the access authorization to the vehicle and the engine start authorization for the means of transport.

Keyless go systems have a transmitting/receiving device arranged on the motor vehicle for communicating with a mobile release device carried by a user. Initiated by an interrogation signal transmitted by the transmitting/receiving device an authorization interrogation is carried out before an opening of the vehicle or an engine start is made possible. If the system detects that a usage-authorized release device is in the vicinity of the motor vehicle, the vehicle is unlocked and the engine start is released.

In conventional driver authorization systems with mechanical ignition key, the access authorization is verified via a mobile release device integrated in the vehicle ignition key. In contrast, the driver authorization is verified via the ignition key inserted into the ignition lock.

From DE 197 47 732 A1, a driver authorization system is

known in which an electronically codable on-board identification device is provided which can be released by means of an external electronic release device, a so-called transponder, which, for example, replaces the mechanical vehicle key. The transponder has a storage element in which the necessary coding for releasing the identification device is stored. So that the release device can communicate with the identification device, it must be positioned in the vicinity of the identification device so that a signal radiated by the identification device can be detected and processed by the release device. The signal of the identification device is checked in the release device and answered with a corresponding response signal, the signal variation of which must correspond to the electronic coding of the identification device. If transmitted signal and response signal of the driver authorization system match, at least one vehicle-specific device of the vehicle, for example an electronic controller for driving an internal combustion engine of the vehicle, is released.

It is also known to integrate the release device into an ignition key. The disadvantage of this is that, apart from the electronic communication between the identification device and the release device, both the ignition key and the ignition lock must have matching shape features. Due to the multiplicity of different locking systems in ignition keys, this results in considerable complexity in the integration of an electronic driver authorization system.

To solve this problem, DE 197 47 732 A1 discloses an identification device which comprises a receptacle into which a release device can be inserted and which exhibits an actuating device which can be triggered by the release device. It is no longer necessary to use an additional ignition key.

From DE 198 53 075 A1, it is also known that the release device can be brought into two positions, one position being used for detecting the release device and the other position being used for triggering an ignition lock function.

From DE 198 60 350 A1, an engine start authorization control unit is known which, after a successful release dialog between an on-board identification device and a mobile identification transmitter, releases an actuating device. This actuating device is implemented with minimum installation space by providing a manually operable actuator with a securing module, the securing module correspondingly releasing the actuator via the identification device. The released actuator enables the steering wheel to be mechanically unlocked and the engine to be started. The actuator can be constructed as a rotary switch which is associated with a pushbutton, the pushbutton being used for starting the release dialog. To start the entire process including the required authorization interrogation, an electrical pushbutton is integrated, for example into the gearstick or gear selection lever at the top.

The known keyless engine start authorization control systems are mostly incorporated in keyless access authorization control systems since the same hardware components can be used for performing the desired question/answer dialog.

Even if such a driver authorization unit as described above increases the operating convenience compared with conventional key systems, an additional actuating device must be provided in the cockpit area of the driver for starting the start process. This actuating device impedes the vehicle design of the cockpit since additional space must be provided for it. Moreover,

there are additional costs for switches and their cabling.

Vehicles with keyless go systems additionally need an emergency operation facility by means of the conventional engine start authorization system consisting of ignition lock and key. The reason for this is the high susceptibility of the keyless go systems to radio interference sources such as, for example, garage door openers, radio headphones etc. These radio interference sources have been released by the communication authority for frequency bands which are also used by keyless go systems.

There is, therefore, the problem of always having to equip vehicles with keyless go systems with the standard electronic ignition lock and ignition key which are also provided for non-keyless go systems. In addition, vehicles with keyless go systems are equipped with an additional pushbutton which is connected to the electronic ignition lock. This increases the production costs since the driver authorization system cannot be produced uniformly for vehicles with/without keyless go systems.

It is then the object of the present invention to develop a keyless go driver authorization system in such a manner that various ignition lock functions can be reliably activated in a simple manner without installing an operating element specially provided for this purpose in a vehicle.

According to the invention, this object is achieved by the features of claim 1. Accordingly, the ignition lock functions can be activated by means of the control unit using a pushbutton that can be mounted and actuated on and removed from the ignition lock without requiring the ignition lock to be operated in the form of

rotating a key inserted into a rotary ignition lock.

The driver authorization system according to the invention has the advantage that the driver authorization system can now be produced in the same manner for motor vehicles with/without keyless go system. The electronic ignition lock control unit, that is to say the electronic ignition lock with the associated control unit, can be produced identically for systems with/without keyless go. No additional cabling to a pushbutton is necessary for motor vehicles with keyless go system. The electronic ignition lock does not have to be adapted to the keyless go system.

A further advantage is that the driver does not need to remember a new position for the starting button for starting the motor vehicle in keyless go mode. Instead, the motor vehicle can be started from the same position independently of whether the motor vehicle is operated with ignition key or in keyless go mode.

It is also advantageous that the keyless go mode can be replaced by the standard system simply by removing the pushbutton. This is of particular importance in vehicles which are equipped with keyless go system. In these vehicles, the pushbutton generally remains inserted. If the keyless go system fails for the above-mentioned reasons, however, the pushbutton can be immediately pulled off and the driver can start the vehicle.

Integrating the mobile release device into the ignition key has the advantage that the driver does not need to carry the ignition key in addition to the mobile unit.

A further great cost saving is that no additional space needs to be provided for a starting button in the design of the cockpit.

The concentration on the system responsible for the driver authorization results in an optimization of installation space. Additional switches, cabling are avoided. The space requirement of the driver authorization system in the cockpit is reduced.

The operator-friendly positioning of the pushbutton on the top of the gear selection lever or of the gearstick is no longer possible in "shift by wire" vehicles. Since the operating elements are positioned close to the steering wheel, the pushbutton is not positioned at the top in order to avoid operating errors by the driver. An operating-friendly pushbutton position is thus no longer available.

The object is also achieved by the features of claim 2. Accordingly, the pushbutton can be mounted and actuated on and removed from an ignition lock of a means of transport and, when the pushbutton is operated, the actuating element interacts with a release switch in the on-board ignition lock in order to activate ignition lock functions without rotating the rotary switch.

The pushbutton according to the invention has the advantage that it can be produced with little expenditure and independently of the ignition lock unit.

The contactless power supply to the pushbutton via inductive voltage coupling is more maintenance-free than a direct mechanical coupling since the tractive forces are lower in the inductive coupling.

There are then various possibilities of advantageously embodying and developing the teaching of the present invention. To this end, reference is made to the

dependent claims, on the one hand, and, on the other hand, to the subsequent explanation of an embodiment. The advantageous embodiments resulting from an arbitrary combination of the subclaims are also to be included. In the drawing, an embodiment of the device according to the invention is shown diagrammatically, where in each case

figure 1 shows a block diagram of the components according to a first embodiment,

figure 2 shows a further embodiment, and

figure 3 shows a longitudinal section through the pushbutton according to the invention.

The driver authorization system 1 for motor vehicles has an on-board identification device 2 for performing a dialog with a mobile release device 31 which verifies the usage authorization. The driver authorization system 1 has an electronic ignition lock (EZS) 4, into which an ignition key 3 can be inserted. The control unit 5 is used for activating the ignition lock functions such as, for example, starting of the engine. The ignition lock functions can be activated by means of the control unit 5 of the EZS 4 via a pushbutton 6 which can be inserted into the ignition lock, actuated and removed. The control unit 5 of the EZS 4 can exchange data, particularly implement the ignition lock functions, with other control units of the vehicle via a data bus 100.

As shown in figure 2, the driver authorization system 1 exhibits a keyless go authorization system with a standard system, the standard system corresponding to a system in which the ignition lock functions such as, for example, starting of the engine, can only be triggered by inserting and possibly rotating the

mechanical ignition lock. The control units 5 - 14 shown in figure 2 enable the various ignition lock functions to be implemented.

The various control units 5 - 14 are connected to the control unit 5 of the EZS 4 via a data bus CAN-C 100 or a data bus CAN-B 200, respectively. The various control units 5 - 14 can also communicate directly via a central gateway (ZGW) 14 connected between these databuses 100, 200.

The network connecting the various control units 5 - 14 thus consists of the data bus CAN-C 100, CAN-B 200 and the ZGW 6, the ZGW 14 being mainly used as router between the two databuses 100, 200.

A mobile release device 31 is integrated into the ignition key 30. The mobile release device exchanges data with the identification device 2 by means of a transponder, an infrared (IR) and a radio-frequency (RF) transmitting/receiving unit.

The control unit 5 is responsible for activating the various ignition lock functions such as, for example, "waking up the databus", "ignition on" and "starting the engine". In addition, the on-board identification device 2 is integrated into the control unit 5 of the EZS 4. The identification device 2 integrated into the control unit 5 receives a release signal, generated with a successful usage authorization verification, via the data bus CAN-B 200.

The control unit 5 of the EZS 4 is supplied with additional information from sensors about the position of the brake pedal, the clutch pedal and/or the door via the databuses CAN-C 100 and CAN-B 200.

The EZS 4 is constructed as rotary lock. The rotary

lock can be switched into a number of positions by means of the ignition key 30. In each position, different ignition lock functions are activated. The EZS 4 has two switches which are operated successively when the ignition key 30, 31 is completely inserted, and generate an electrical signal. The control unit 5 of the EZS 4 recognizes from the order of the signals and on the basis of the switch from which the signal comes whether the ignition key 30 is inserted half way or completely or if an ignition key 30 or a pushbutton 6 has been inserted. The pushbutton is identified by the fact that it triggers only one switch of the EZS 4. The EZS 4 additionally has coils which provide for inductive voltage coupling to the pushbutton 6.

The pushbutton 6 can be inserted into the EZS 4, operated and removed. When it is operated, that is to say by pressing the pushbutton 6, an electrical signal is generated. Together with the signal from the identification device 2 and the information about the vehicle available in the control unit 5 of the EZS 4, the ignition lock functionalities of the rotary lock with ignition key 30 are replicated via the pushbutton 6.

The inserted pushbutton 6 is inductively supplied with voltage in the EZS 4 via the control unit 5. This voltage is used for illuminating the pushbutton 6 by means of light-emitting diodes.

An intelligent server module control unit (ISM) 7 is connected to the control unit 5 of the EZS 4 and the other control units 6 - 14 via the databus CAN-C 100. The ISM 7 monitors ignition lock functions which cannot be duplicated via an engine control unit (MSG) 8. For example, the ISM 7 locks the gearbox in the "P" position of the selection lever of an automatic gearbox or the ISM 7 cancels the immobilizer.

The MSG 8 is connected to the control unit 5 of the EZS 4 and the other control units 6 - 14 via the databus CAN-C 100. The MSG 8 converts the commands to the engine delivered by the control unit 5 of the EZS 4, such as "engine start" and "engine off".

The door control devices (TSG) of driver and passenger door 9, 10 are connected to the network via the databus CAN-B 200. The TSG 9, 10 can be used for driving the locking motors of the doors. The TSG 9, 10 also provide an infrared receiver which is designed for the case where the key 3 is only used for access control, that is to say opening of the vehicle.

The signal detection and drive module for the rear (SAM/H) 11 is connected to the network via the databus CAN-B 200. The control unit SAM/H 11 has a transmitting/receiving device. This transmitting/receiving device is used for cableless data transmission to the mobile release device 31 integrated in the ignition key 30. The data are transmitted in the RF band. The SAM/H 11 is thus used as gateway between the mobile release device 31 in the ignition key 30 and the on-board network. The other control units 5 - 14 thus have access to the dialog data between mobile release device 31 and ignition key 30 and SAM/H 11 via the control unit SAM/H 11.

The signal detection and drive module for the front (SAM/V) 12 is connected to the network via the databus CAN-B 200. The control unit SAM/V 12 is used by the control unit 5 of the EZS 4 for switching terminals which is necessary in particular ignition lock functions. In particular, this relates to switching terminals "15" and "50".

A control unit 13 for converting the keyless go

functions is connected to the network via the databus CAN-B 200. The keyless go control unit 13 has a source of inductance for waking up the transponder in the mobile release device 31 in the ignition key 30. The keyless go system control unit thus determines the location of the mobile release device 31 or of the ignition key 30, respectively, and initiates the release dialog. The control unit 13 is preferably active only when the pushbutton 6 is inserted into the EZS, the driver authorization system 1 is operated in keyless go mode.

In the standard system without keyless go functions, that is to say without the pushbutton 6 being inserted in the EZS 4, the driver authorization system 1 operates as follows: the driver authorization system 1 first verifies the access authorization by means of the TSG 9, 10. As soon as the user is in the vehicle and inserts the ignition key 30 into the EZS 4, the driver authorization is verified by means of IR communication via EZS 4.

The access authorization and the opening of the doors is implemented by sending a coded signal by means of the IR transmitter of the mobile release device 31 in the ignition key 30 to the TSG 9. When the user has been successfully identified from the transmitted signal by the identification device 2, the doors are opened by means of the TSG 9, 10 via the control unit 5. The user enters the vehicle.

The driver authorization is verified via the possession of the ignition key belonging to the vehicle. For this purpose, the ignition key identity is checked in the first position, position "0" of the EZS 4. Position "0" of the EZS 4 corresponds to the position "key inserted". In this position, the signal "key inserted" is generated if the ignition key 30 is completely

inserted. A release dialog is conducted between the release device 31 and the identification device 2 via IR communication. When authorization is given, the on-board system is woken up, the immobilizer and other theft protection systems are cancelled.

The other positions of the EZS 4 activate further ignition lock functions:
Position "1" corresponds to the radio setting. In this position, the convenience electronics such as radio, window opener, seat adjustment etc. are taken into operation.
Position "2" corresponds to the position "ignition on". In this position, voltage is applied to terminal 15. The drive train electronics such as engine control unit, chassis control unit etc. are taken into operation.
Position "3" corresponds to engine start. In this position, voltage is applied to terminal 50. The engine is started.

With keyless go functions, that is to say with pushbutton 6 inserted into EZS 4, the driver authorization system 1 operates as follows: the driver authorization system 1 verifies the access authorization and the driver authorization via the keyless go control unit 13, the identification device 2 and the pushbutton 6. No ignition key 30 is inserted into the EZS 4 in order to start the engine.

Establishing contact with the mobile release device 31 integrated into the ignition key 30 by the control unit 13 is initiated by an action of the user at the vehicle, for example touching the driver's door, pressing the pushbutton etc. During this process, the keyless go control unit 13 produces an inductive field which is sufficient for waking up the transponder. The mobile release device 31 then switches to RF

transmission for the actual release dialog. During this process, a coded identification signal is forwarded via the SAM/H 11 to the CAN-B 200 where it can then be picked up and verified by the identification device 2 and a release signal can be forwarded.

By means of the inserted pushbutton 6 and the additional information of the control unit 5 about brake pedal position, door position etc., the ignition lock functions defined by means of the positions "0, 1, 2, 3" of the EZS 4 can now also be activated.

Inserting the pushbutton 6 into the EZS 4 does not trigger any response. When the pushbutton 6 is pressed, a pair of plungers extends which only generates the signal "key inserted" in the EZS 4 without actuating any other switch in the EZS 4. The control unit 5 of the EZS 4 thus recognizes that it is not an ignition key 30 but the pushbutton 6 which is inserted in the EZS 4. The release dialog is correspondingly started via the keyless go control unit 13. As mentioned above, the control unit 13 then searches for the mobile release device 31. When the authorization has been successfully verified by the identification device 2, a release signal is produced which is then checked by the control unit 5 of the EZS 4 for activating the ignition lock functions.

The ignition lock function of position "3" of the EZS 4, the engine start, is activated by pressing the pushbutton 6 and simultaneously operating the brake.

The ignition lock function of position "1" of the EZS 4, the radio position, is activated by pressing the pushbutton 6 a first time and simultaneously not operating the brake.

The ignition lock function of position "2" of the EZS

4, the position "ignition on" is activated by pressing the pushbutton 6 a second time and simultaneously not operating the brake.

The ignition lock function of position "0" of the EZS 4, the position "key inserted", is activated by pressing the pushbutton 6 a third time, simultaneously not operating the brake and all doors being closed at the same time.

Figure 3 shows a pushbutton 6. The pushbutton 6 has a cap 61 via which an actuator 62 is pressed. The actuator 62 is elastically supported via a restoring spring 63 so that the actuator 62 returns into its initial position after having been operated. The restoring spring 63 is constructed as compression spring. When the actuator is pressed, it is moved to a position which is predetermined by a locking slide. The actuator 62 is mechanically connected to a pair of plungers 66. The pair of plungers is constructed as release plunger which can be released in parallel with an axis of symmetry of the pushbutton when operated. Pressing the actuator 62 thus also moves the pair of plungers which triggers the signal "key inserted" by operating the switch in the EZS 4. The structure of the pushbutton 6, that is to say the cap 61, the actuator 62, plunger, compression spring, is enclosed in a left- and right-hand sleeve.

The pushbutton 6 also has two light-emitting diodes (LED) 64 on a circuit board. The circuit board is attached to the top of the actuator. Underneath the circuit board, a coil 65 for inductive voltage coupling to the EZS 4 is in each case attached. The inductive voltage coupling supplies the LEDs with voltage. The LEDs illuminate the cap 61 of the pushbutton 6.

The EZS 4 also has two coil units 65 which are arranged

in such a manner that the coils of the inserted pushbutton 6 largely overlap the coils of the EZS 4. This ensures optimum energy transmission between EZS 4 and pushbutton 6. The coils in the EZS 4 are only supplied with alternating frequency via the control unit 5 when a signal for the finding or search illumination of the displays and knobs in the vehicle is present from a brightness sensor on the CAN-B 200.

The pushbutton 6 can also be constructed as electronic pushbutton. In this arrangement, touching the pushbutton triggers an electronic signal via a sensor, which signal is forwarded to the control unit 5 via the ignition lock 4.

The pushbutton 6 is constructed so that it can be inserted into the ignition lock 4, actuated and removed. The pushbutton 6 can also be mounted, for example, on a holder attached to the ignition lock 4. For this purpose, the holder could accommodate a bayonet or turn-lock fastener.

The pushbutton 6 can also be equipped with a wireless communication unit which, when the pushbutton is operated, communicates with the release device and/or control unit as a result of which the ignition lock functions described above are activated.

The databus used are CAN databuses. However, it could also be another databus system such as, for example, MOST, Flex-Ray. It could also be a so-called wireless network. The important factor is only that the control unit 5 of the EZS, the mobile release device 31 and the EZS 4 can exchange data with one another and with the corresponding control units of the vehicle for implementing the ignition lock functions.

The mobile release device 31 can be constructed as

credit card, key or similar mobile unit. The embodiment in the ignition key 30 is obvious since the driver then always has both opportunities for operation. The type of data transmission for the mobile release device 31 is not restricted to IR, RF, transponder. Instead, wireless data transmission is the main type considered.

It is not obligatory to distribute the various functions to the control units 5 - 14. For example, the identification device 2 can also be implemented in a separate control unit. The control unit 13 could be integrated in the control unit 5 of the EZS 4, etc.